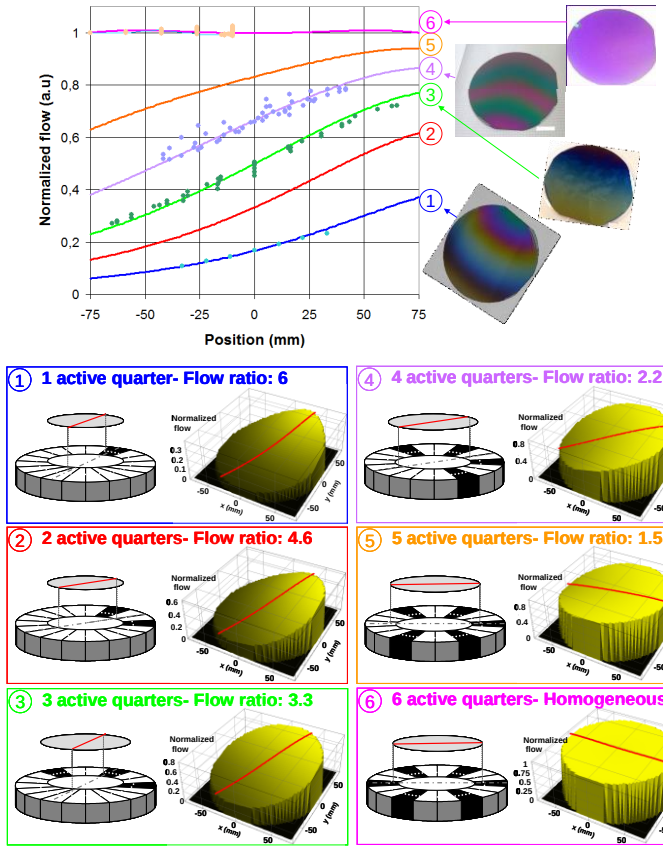
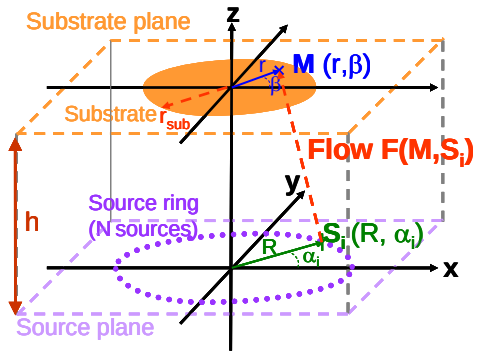
Modelling and simmulations





Equation 1. Flow at substrate point M from source S_i

$$F_{surf}(S_i) = \mathcal{G} \times \frac{I_o}{\pi} \frac{h^2}{(R^2 + r^2 + h^2 - 2Rr \times \cos(\alpha_i - \beta))^2} \quad \text{with} \quad I_o = \frac{(P_{prec} - P_{GR})}{\sqrt{2\pi M R_g T}} \times A$$

Equation 2. Fraction of emitted molecules from source S_i that reach the substrate.

$$Eff = 0.5 \times (1 + \frac{r_{sub}^2 - R^2 - h^2}{\sqrt{h^4 + R^4 + r_{sub}^4 + 2h^2R^2 + 2h^2r_{sub}^2 - 2R^2r_{sub}^2}})$$

Equation 3. Flow at substrate point M from a set of n sources S_i (i=1 to n)

$$F_{surf}(n\,sources\,S_i) = \sum_{i=1}^{n} F_{surf}(S_i)$$

Equation 4. Flow at substrate point M from all a very large number of S_i on a ring

$$F_{surf}(ring) = \mathcal{G} \times \frac{I_o \times N}{\pi} \times \frac{h^2 \times (h^2 + R^2 + r^2)}{(h^4 + R^4 + r^4 + 2h^2R^2 + 2h^2r^2 - 2R^2r^2)^{3/2}}$$

Figure- Comparison of experimentally deposited thickness (normalized) and theoretical flow calculation as a function of the number of active pre-chamber segments along a 6 inch wafer diameter (in the main gradient direction), for a single element deposition. Each curve corresponds to a given number of active segments and each situation is represented schematically in a rectangle below the main graph. The position of the active segment(s) is highlighted in black on the pre-chamber scheme and the main gradient direction diameter is represented in red on the 3D deposit shape simulation (in yellow).

Figure- Geometric scheme of the system and flow calculation.